

Pleasant Bay Subwatershed

Orleans, Chatham, Brewster, and Harwich Cape Cod,
Massachusetts

The Pleasant Bay Subwatershed is located in Orleans, Chatham, Brewster, and Harwich. The subwatershed, with an area of 14,167 acres, is made up of numerous subembayments of Pleasant Bay, islands, ponds, creeks, and rivers. Pleasant Bay is the largest estuary on Cape Cod and one of the most biologically productive marine habitats on the East Coast. It is comprised of 9,050 acres of barrier beaches and islands, salt marsh, tidal flats, numerous fresh and saltwater ponds, and a significant estuarine habitat. The barrier beaches provide storm damage prevention. There are four anadromous fish runs and extensive shellfish beds in the subwatershed. Twelve threatened or endangered species occur within the Pleasant Bay area, with 16 more species listed as special concern in Massachusetts.

The Towns of Orleans, Chatham, and Harwich have worked cooperatively for more than 15 years to protect the Bay's natural resources amidst rapid development and competing commercial and recreational activities in the area. In the late 1980's, the Towns of Orleans, Chatham, Harwich, and Brewster petitioned the state to designate Pleasant Bay as an Area of Critical Environmental Concern (ACEC). The ACEC was designated in 1987. Through a cooperative agreement, the towns developed a resource management plan for the ACEC. In 1998, the towns formed the Pleasant Bay Resource Management Alliance to implement the recommendations of the resource management plan.

The Pleasant Bay estuarine system is generally healthy, with evidence of excessive nutrient loading in certain areas. Testing done by the Pleasant Bay Citizen Water Quality Monitoring Program in 2000 indicated that eight sampling stations were "eutrophic," while the remaining ten stations had "fair" water quality. For all sampling locations in the Bay, total nitrogen exceeded the expected background level of in-flowing ocean water. This confirms that the Bay is receiving nitrogen from watershed development through groundwater inflows and surface runoff. Phytoplankton concentrations for all sampling locations exceeded five parts per billion, which is indicative of impacts from watershed development.

According to the Water Quality Analyses of Coastal Embayments in Chatham, MA (2001), the water quality and biological indicator data show that the smaller embayment systems in the Chatham portion of the subwatershed are heavily impaired by watershed nitrogen inputs. Muddy Creek and Frost Fish Creek are presently showing poor habitat quality. These embayments are sufficiently eutrophic to be unable to support significant fauna or eelgrass populations.

The Orleans Water Quality Task Force and the Pleasant Bay Resource Management Alliance have five years of data that indicate that the three farthest inland saltwater ponds (Meetinghouse, Kescayogansett, and Areys) have water quality in the eutrophic range, that is, dissolved oxygen is below the levels needed to maintain healthy water quality. According to Division of Marine Fisheries Sanitary Surveys, the impacted water quality in Arey's Pond may lead to a seasonal closure of the shellfishing resource. The Namequoit River leading into the pond is narrow and provides it with minimal flushing with Little Pleasant Bay. This is coupled with increasing development in the subwatershed and increased use of the waterfront.

Pilgrim Lake is currently experiencing problems with the aquatic weed Elodea. The lake is heavily used for recreation and has a Town beach where swimming lessons are held. The lake supports an active herring run as well as habitat for perch, pickerel, and bass. In addition to making swimming unpleasant and limiting access for fishing, a concern is whether the increase of Elodea is having an effect on the spawning of herring.

A 1996 field investigation by the Army Corps of Engineers found evidence of 24 acres of degraded tidal wetlands at Freemans Pond and determined the area to be tidally restricted.

The Acid Rain Monitoring Project by UMass-Amherst found the Acid Neutralizing Capacity of Crystal Lake to be in the “critical” range, meaning that the natural environment may be unable to buffer acid deposition enough to prevent a drop in the pond’s pH. The pH of the pond ranged from 6.23 to 6.34.

The Pleasant Bay Subwatershed can still undergo a significant amount of development before it reaches build-out under current zoning laws. A study released by the Pleasant Bay Alliance in 2002 identified a potential 28 percent increase in development in the subwatershed. A separate study of shorefront parcels on Pleasant Bay determined that there are 275 acres of undeveloped private land along the shore, which represents 9% of shorefront parcels.

The subwatershed supports many productive shellfish resource areas and these areas have been evaluated for stormwater inputs into their waters. There are no known significant inputs into the Chatham portion of Pleasant Bay or Bassing Harbor. There are four locations in the north area of Chatham Harbor where stormwater is piped into the shellfish resource area. At the present time, these locations do not have an adverse impact on water quality due to the high level of flushing resulting from the breach. Several of these piped discharges will be reduced or eliminated as part of town work along Main Street to improve runoff.

The only stormwater input to Crows Pond, an important shellfish resource area, is from a single catchbasin on Fox Hill Road that discharges to fringing marsh along the edge of the Pond. Testing has not shown significant impact to the resource area.

There are two locations where stormwater pipes discharge to Ryder’s Cove, another important shellfish resource area. The first is located at the Ryder’s Pond Road town landing where a catch basin discharges runoff from the parking area and adjoining roadway. This discharge is located within the Conditionally Approved area for the adjacent Ryder’s Cove Boatyard. The second location is a headwall for two catchbasins located along Route 28. In addition, there are several locations along Route 28 where paved waterways discharge toward the resource area. These Route 28 locations are awaiting action by MassHighway.

Frost Fish Creek also receives stormwater runoff from Route 28 and is awaiting action by MassHighway to mitigate. Additionally, the creek receives flow from an upland wetland system where an extensive marsh system and accompanying wildlife/waterfowl (i.e. “natural”) are the most likely sources of elevated coliform counts. Poor flushing due to undersized culverts under Route 28 also impacts the system.

Muddy Creek has poor flushing due to an undersized culvert under Route 28. Stormwater enters via a paved waterway from Route 28 and surface runoff enters from the Jackknife Harbor entrance road and via a corrugated drain off Sugar Hill Dr. (Harwich side). It is difficult to determine the extent to which stormwater is a problem due to flushing and waterfowl/wildlife issues.

Most areas in the Towns of Orleans, Chatham, Brewster, and Harwich have a municipal water supply. Plans to construct an iron and manganese treatment facility off Cliff Pond Road in Orleans are underway to address high concentrations of the substances in four of the town wells. Almost all development in this subwatershed is served by onsite septic systems for wastewater management. There are no municipal sewers in Orleans, Brewster, or Harwich.

The older section of Chatham, near Mill Pond, is municipally sewered. Sewers run up Main Street and Cross Street, and out of town to West Chatham. There are 450-500 sewer connections with five miles of gravity sewer and three miles of pressure sewer. The treatment plant can handle 440,000 gallons/day, though it is limited to 150,000 gallons/day under an administrative order. Currently the plant is processing about 120,000 gallons/day on an annual average. The effluent is being denitrified. Chatham is looking at alternatives for improving water quality through the development of its Comprehensive Wastewater Management Plan.

The Town of Orleans is developing a management plan to comprehensively assess options for controlling the amount of nitrogen coming from wastewater systems throughout the town. This plan is expected to be completed in 2005.

Stewards:

- Pleasant Bay Resource Management Alliance (www.pleasantbay.org)
- Orleans Water Quality Monitoring Task Force
- Friends of Pleasant Bay
- Friends of Meetinghouse Pond
- Friends of Pilgrim Lake
- Friends of Crystal Lake
- Friends of Baker Pond
- Friends of Arey's Pond
- Harwich Shellfish and Marine Water Quality Committee
- Chatham High School
- Chatham Water Watchers
- Friends of Chatham Waterways

Studies conducted in the watershed:

- Hydrodynamic and Tidal Flushing Study of Pleasant Bay Estuary, MA. 1997. J.S. Ramsey, Aubrey Consulting, Inc. Final Report revised April 1998 and December 1999.
- Cape Cod Wetlands Investigation. June 1996. US Army Corps of Engineers, New England Division.
- Orleans Marine Water Quality Task Force: Nutrient Project. Report to Town of Orleans by R.J. Wineman. 1997.
- Groundwater Quality Near a Septage Treatment Facility, Orleans, Massachusetts, 1997-98. United States Geological Survey.
- Pleasant Bay Nitrogen Loading Study, Final Report. May 1998. Water Resources Office, Cape Cod Commission.
- Survey of Orleans Property Owners in the Arey's Pond and Namequoit River Watershed. 1999.
- Citizens' Guide to Estuarine Protection: Nitrogen Management for the Arey's Pond Watershed. Fall 2000. Pleasant Bay Resource Management Alliance. Additional guides are planned for the Muddy Creek (Harwich/Chatham), Round Cove (Harwich), and Pochet (Orleans) subwatersheds.
- Pleasant Bay Watershed Priority Open Space Project – 2001. The Compact of Cape Cod Conservation Trusts, Inc. Created a ranking list of undeveloped parcels, which, if acquired as open space, would protect the most important natural resource areas of Pleasant Bay.
- Water Quality Analyses of Coastal Embayments in Chatham, MA (Draft Report). May 2001. Applied Coastal Research and Engineering, Inc., Applied Science Associates, Inc., School for Marine Science and Technology.
- Water quality monitoring and aquatic vegetation surveys to collect baseline data and characterize the present health of Pilgrim Lake, Baker Pond, and Crystal Lake. Study conducted by the Town of Orleans, Orleans Water Quality Task Force, and a friends group of each pond. 2000.
- Baseline Study to Characterize the Present Health of Crystal Lake, a Great Pond, located in Orleans, MA (YR-2000). Massachusetts Lake and Pond Grant Program provided 50% of the funds for this study.
- Pleasant Bay Citizen Water Quality Monitoring Program Interim Report 2000. Pleasant Bay Resource Management Alliance. Spring 2001.
- Reconnaissance Hydrography of the Upper Reaches of Little Pleasant Bay, Orleans, MA. 2001. G.S. Horne and C.F. Horne. Studied Arey's Pond.

- Pleasant Bay Citizen Water Quality Monitoring Program Interim Report 2001. Pleasant Bay Resource Management Alliance. Fall 2002.
- Pleasant Bay Shoreline Access Enhancement Program. Pleasant Bay Resource Management Alliance. 2001.
- Intertidal Habitat and Sediment Assessment Project. Pleasant Bay Resource Management Alliance. Study began in Sept. 2000 and is ongoing.
- Resource Assessment of Freshwater Lakes and Ponds within the ACEC. Eleven waterbodies will be assessed. Pleasant Bay Resource Management Alliance received funding for project in Fall 2001 from the Community Foundation of Cape Cod. Horsely & Whitten, Inc. are conducting the assessment.
- Harwich Property Tracts 30 and 39, Chatham Property Tract 5, and Brewster Property Tract 30 were evaluated for their suitability for future water supply sites in the Phase II Priority Land Acquisition Assessment Project conducted by the Cape Cod Commission. March 2001.
- Acid Rain Monitoring Project by the University of Massachusetts-Amherst, 2001. Crystal Lake was among the waterbodies sampled. Samples are taken three times a year, in April July, and October.
- Cape Cod Atlas of Tidally Restricted Salt Marshes. 2001. Cape Cod Commission.
- DEM invasive aquatic weed "pilot project." Summer 2002. Monitoring Baker Pond in Orleans.
- Chatham High School is conducting a biodiversity study at Muddy Creek to assess the biodiversity of various locations and determine the effect of water temperature and adjacent land use on the biodiversity in Muddy Creek.
- The Bassing Harbor/Ryders Cove/Frost Fish Creek and Muddy Creek estuaries were selected as priority areas for the Estuaries Project – Southeastern Massachusetts Embayment Restoration, funded by the state and UMass Dartmouth. The goal of the project is to develop critical nutrient loading thresholds for each embayment to aid in water resources planning the thresholds will support federal requirements for the development of Total Maximum Daily Loads for impaired surface waters. These areas will be evaluated in 2002.
- Upper Pleasant Bay and Pleasant Bay were selected as priority areas for Year 2 of the Massachusetts Estuaries Project. These areas will be evaluated in 2003.

Who is collecting water quality data and where:

- Chatham Water Watchers sample Muddy Creek, Bassing Harbor, and Chatham Harbor for dissolved oxygen, water temperature and clarity, water depth, salinity, nutrients, and chlorophyll a/ pheophytin
- Harwich Shellfish and Marine Water Quality Committee sample Muddy Creek, Round Cove, and Pleasant Bay for water temperature and clarity, salinity, fecal coliform, dissolved oxygen (DO), nitrate-nitrogen, and phosphate.
- Orleans Water Quality Monitoring Task Force: 45 sampling stations being monitored for nutrients, DO, Secchi, temperature, and chlorophyll-a, collected in Cape Cod Bay, Nauset Estuary, and Pleasant Bay. The group also monitors water quality in 16 freshwater ponds.
- Pleasant Bay Alliance Citizen Water Quality Monitoring Program: Chatham Harbor, Bassing Harbor, Inner Ryder's Cove, Crows Pond, Muddy Creek, Big Bay (Southwest, Mid, and Northeast), Round Cove, Quanset Pond, Paw Wah Pond, Namequoit Point (South and North), Arey's Pond, Kescayogansett Pond, and Meeting House Pond. Four new marine monitoring stations were added in 2002; sites are off the Cotchpinicut/Scatteree area, between Nickerson's Neck and Strong Island, off the northeast corner of Strong Island, and the area off the East Egg

section of Orleans. Sampling is done for physical parameters, chlorophyll a/pheophytin, and nutrients. The program emphasis is on nutrient levels as a means of observing impacts from land uses in the Bay's subwatershed.

- The United States Geological Survey maintains stream flow gauges in Pilgrim Lake, PawWah Pond, Lovers Lake/Stillwater Pond, and Stillwater Pond/Ryders Cove, collecting data that will be used in the Massachusetts Estuaries Project.
- Chatham High School: Frost Fish Creek

Management actions taken:

- Through a cooperative agreement, the Towns of Brewster, Chatham, Harwich, and Orleans developed the Pleasant Bay Resource Management Plan in 1998. The plan seeks to preserve the bay's traditional uses and manage competition for use of the bay's shores, water, shellfish, and other resources.
- Round Cove Stormwater Mitigation Project. Project involves the installation of six infiltration catch basins on Cove Landing Road, designed to catch and treat the "first flush" of bacteria laden stormwater that is currently being released, untreated, into Round Cove. Funded by a grant from the Coastal Remediation Program (Year 2000).
- Pleasant Bay Resource Management Alliance developed a QAPP for the Pleasant Bay Citizen Water Quality Monitoring Program. Nov. 2001.
- In December 2001, the Cape Cod Commission approved a request from the Town of Brewster to withdraw 38.6 million gallons of water annually to irrigate its Captain's Golf Course. Some area residents are concerned that water applied to the golf course is having a drying effect on nearby wetlands. The Town of Brewster is willing to install a water-level monitoring system on the course so pond levels can be checked. The request is subject to approval by the full commission.
- Massachusetts Division of Fisheries and Wildlife stocks Crystal Lake and Goose, Higgins, Little Cliff, and Schoolhouse Ponds with rainbow, brook, and brown trout.
- Town of Orleans did remediation work on Meeting House Pond in the 1990's.

Subwatershed facts: (For data sources see Appendix)

- 21 E sites: 2 – 1st National Bank of Boston, Old Harbor Rd.; Acme Laundry, Orleans Rd.
- Solid waste sites: none
- Zone IIs located in this watershed: 5
- Interim Wellhead Protection Areas (IWPAs): 5
- Percent of the undeveloped land that is protected (according to 1985/1990 data): 50.4%
- Acres of existing wetlands: 816
- Certified vernal pools: 4
- Named freshwater ponds & lakes: Grassy Nook, Little Cliff, Higgins, Rafe (*Brewster*), Meeting House, Uncle Harvey's, Crystal Lake, Gould, Pilgrim Lake, Baker's, Chigger, Wash, Uncle Israel's, Shoal, Deep, Uncle Seth's, Twinings, Sarah's (*Orleans*), Crows, Minister, Goose, Trout, Ryder's, Schoolhouse, Mary's Barclay, Pinkwink, Stillwater, Lovers Lake, Salt, Black (*Chatham*), Olivers (*Harwich*), Grassy, Mud (*Brewster, Harwich*)
- Named rivers or creeks: Namequoit River (*Orleans*), Muddy Creek (*Chatham, Harwich*), Frost Fish Creek (*Chatham*)
- Outstanding Resource Waters: Pleasant Bay and tributaries thereto; Pilgrim Lake, Quanset Pond, Crystal Lake, Paw Wah Pond, Uncle Seth's Pond, Sarah's Pond, Arey's Pond, Gould Pond,

Kescago Gansett Pond, and Meeting House Pond (*Orleans*); Stillwater Pond, Lovers Lake, Mill Pond, Ministers Pond, and Crows Pond (*Chatham*)

- Beach Closures: Pleasant Bay Beach was closed to swimming for at least one day during the 2001 season due to high enterococcus bacteria counts.
- Shellfish growing areas: Pleasant Bay, Bassing Harbor, Crows Pond – Approved for shellfish harvesting. Round Cove – Conditionally Approved. Ryder's Cove – most is Approved, Ryders Cove Boatyard is Conditionally Approved, and there is a small (<2 acres) Prohibited area which serves as a buffer to the Frost Fish Creek Prohibited area. Frost Fish Creek – Prohibited/Administrative Closure since 1984. Muddy Creek between Route 28 and Pleasant Bay – Conditionally Approved area, south of Route 28 – Prohibited area. Arey's Pond may soon be downgraded to Conditionally Approved.
- This watershed contains Natural Heritage and Endangered Species Program (NHESP) Estimated Habitats of Rare Wildlife.

Priorities:

- Develop critical nutrient loading thresholds for Bassings Harbor/Ryders Cove/Frost Fish Creek to aid in water resources planning and the development of TMDLs.
- Add the Pleasant Bay System and Cedar, Baker, Pilgrim, and Crystal Ponds in Orleans to the Massachusetts 303(d) List. (Cape Cod Watershed Team request in 2000).
- Develop a lake and watershed management plan based on the results of the water quality monitoring and aquatic vegetation surveys for Pilgrim Lake, Baker Pond, and Crystal Lake. Town of Orleans. (2001 Lake and Pond Grant Program).
- Develop plan to reduce nutrient loads to Orleans saltwater ponds of Pleasant Bay over the next 5 years.
- Monitor the water quality and conduct remediation on Cedar, Boland, Little Quanset, Shoal, and Sarahs Ponds.
- Olivers, Deep, Shoal, Twinings, Sarah, and Quanset Ponds need volunteers to participate in the Pond and Lakes Stewardship Project (PALS), measuring water quality and other characteristics of the ponds.
- Acquire of open space along Muddy Creek in Harwich.
- Evaluate impacts of proposed commercial boat haul out facility along Ryder's Cove Road.
- Monitor the four locations in the north area of Chatham Harbor where stormwater is piped in for adverse impacts on water quality.
- Work with MassHighway to address runoff from Route 28 to Ryder's Cove.
- Work with MassHighway to address stormwater runoff from Route 28 to Frost Fish Creek.
- Address undersized culverts under Route 28 that inhibit flushing of Frost Fish and Muddy Creeks.
- Determine how much runoff from upper roads impacts the water quality of Arey's Pond.
- Monitor and install BMP at pipe emanating from Namequoit Road into Paw Wah Pond.
- Monitor culvert on boat ramp on Kescayo Gansett Pond.
- Conduct a townwide study of wastewater management in Orleans by 2003 to decide the best solution for each part of town (Orleans Local Comprehensive Plan).
- Manage aquatic weed Elodea in Pilgrim Lake.
- Develop funding partnerships with the between the Town of Brewster and the Brewster Conservation Trust, state and federal agencies, and land donations by private landowners in order to achieve their goal of preserving half (2,900 acres) of remaining open space.

- Develop citizens' guides to estuarine protection for subwatersheds within the Pleasant Bay Watershed, similar to publication for Arey's Pond by the PB Resource Management Alliance .
- On Baker's Pond – conduct additional water quality monitoring, a sediment survey, a plankton assessment, and a bathymetry update; correct road related stormwater flow into the pond; and distribute educational brochures to shoreline residents. (From water quality assessment done by Town of Orleans and partners on Baker's Pond 2001).
- Implement those salt marsh restoration projects identified in the 2001 *Cape Cod Atlas of Tidally Restricted Salt Marshes* that have been evaluated and prioritized by the town. Sites are: Route 28 and Earthen Dike restriction of Frost Fish Creek (site CH-6), Route 28 restriction of the Muddy River (HA-9/CH-7), Restrictions of Paw Wah Pond by Namequoit Road (OR-5) and by Earthen Berm (OR-6), and Cranberry Bog Berm restriction of creek off The Narrows (OR-7).
- Expand citizen water quality monitoring program in Orleans.
- Expand the Pleasant Bay Resource Management Alliance water quality monitoring program to include monitoring stations of fresh water inflows in Big Pleasant Bay, for use in the Massachusetts Estuaries Program.
- Remove purple loosestrife and other invasives around Crystal Lake.
- Continue Chatham High School biodiversity study at Muddy Creek.

Recreation:

Camping areas: Nickerson State Park

Pathways and trails: Frost Fish Creek Trail, Cape Cod Rail Trail, Bakers Pond Conservation Area, Kent's Point, Paw Wah Point, Cape Cod National Seashore

Golf courses: Captains Golf Course, Chatham Seaside Links, Eastward Ho Country Club

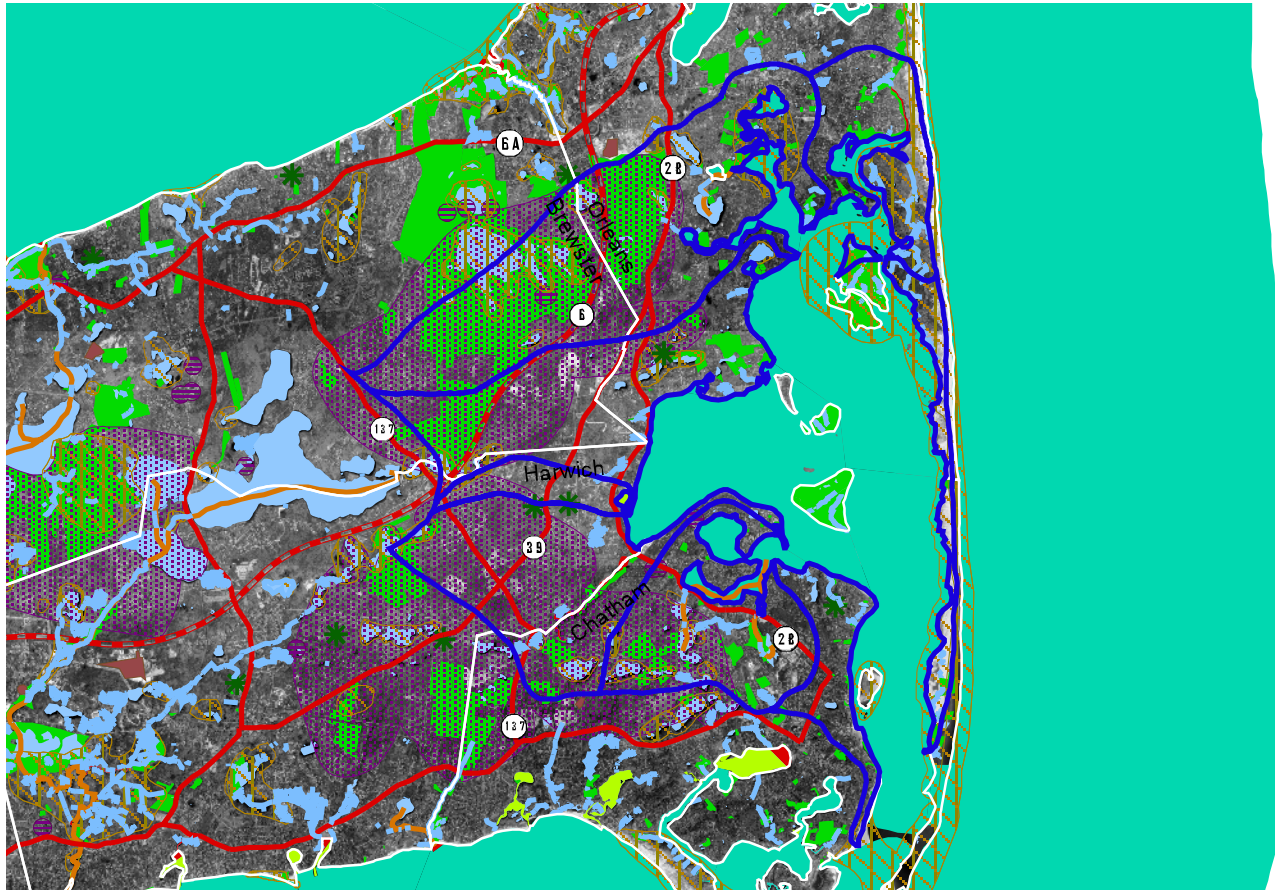
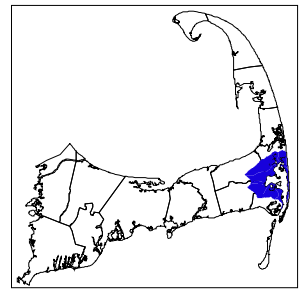
Public access points: 26

Public beaches and landings:

- 71 miles of coastline with approx. 165 docks & piers
- Beaches on Lovers Lake, Schoolhouse Pond, Little Cliff Pond, Pilgrim Lake, Baker's Pond, Community Beach on Pleasant Bay, Pleasant Bay Beach
- Boat landing on Lovers Lake
- Landings on Schoolhouse Pond, Goose Pond, Meeting House Pond (2 landings), Uncle Harvey's Pond, Pochet Inlet (4 landings), Quanset Pond, Paw Wahs Pond, Elis Creek, Pilgrim Lake, Arey's Pond, Round Cove, Kescayogansett Pond, Crystal Lake (2 landings)

Pleasant Bay

Orleans, Chatham, Brewster, and Harwich, MA



Watershed Resources



0 1 2 3 Miles

Natural Heritage and Endangered Species Program Data

- Certified Vernal Pool
- Priority Habitats of Rare Species
- Estimated Habitats of Rare Species

Groundwater Protection Areas

- Interim Wellhead Protection Area
- Zone II
- Solid Waste Facility

Watershed Boundary

Anadromous Fish Run

Shellfish Growing Areas

- APPROVED
- CONDITIONALLY APPROVED
- MANAGEMENT CLOSURE
- PROHIBITED
- RESTRICTED

Open Space

Streams

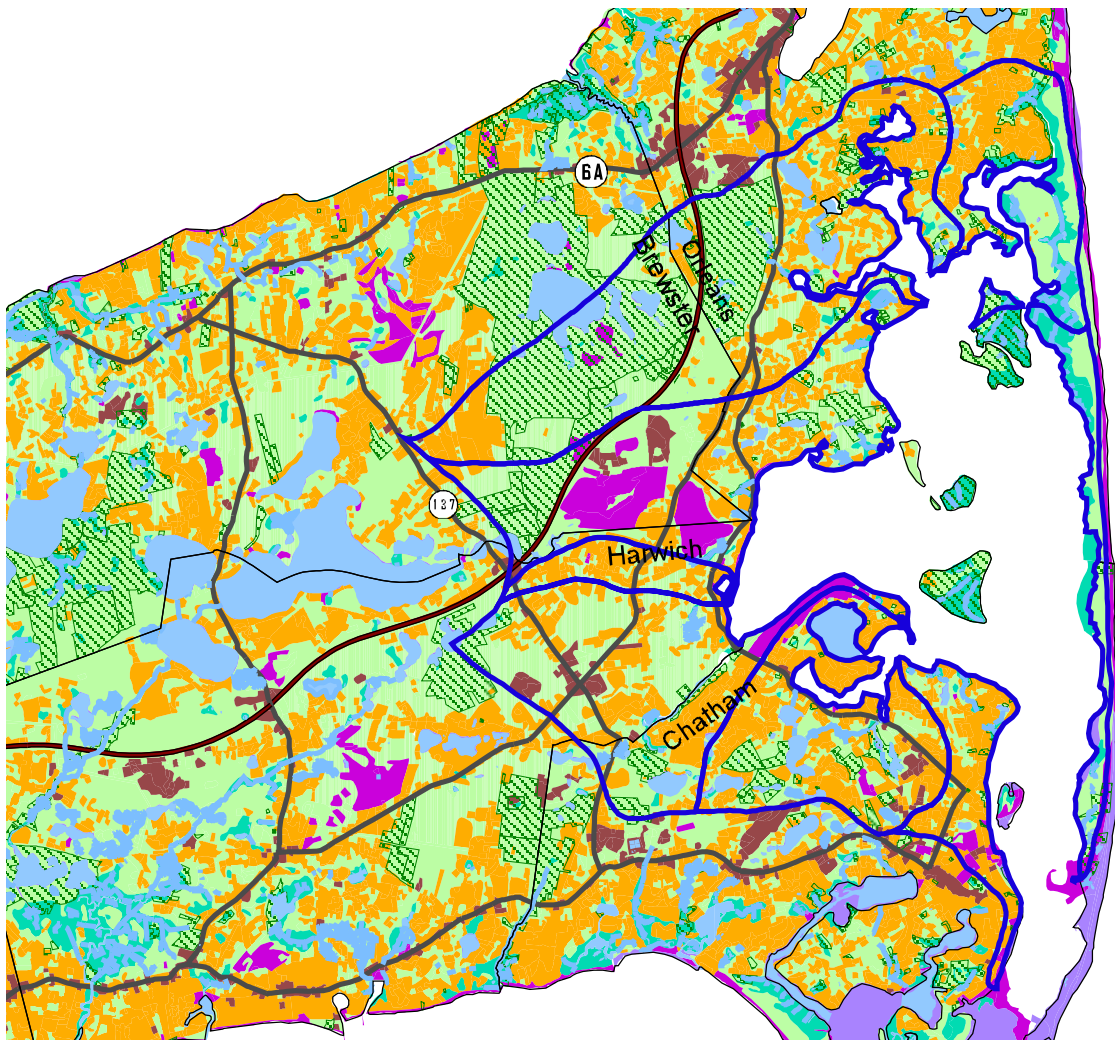
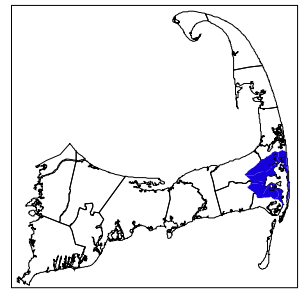
Ponds

Roads

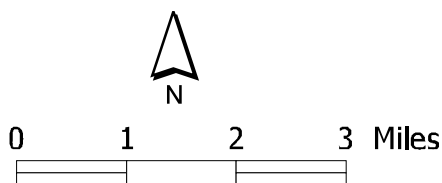


Pleasant Bay

Orleans, Chatham, Brewster, and Harwich, MA



Land Use



Land Use

